CLAIMS

What is claimed is:

1. A method for forming an LED device with a metallic substrate, comprising the steps of:

providing a provisional substrate;

forming an LED epitaxial structure and a first electrode layer on said provisional substrate in sequence;

forming a metallic permanent substrate on said first electrode layer;

removing said provisional substrate to expose a surface of said LED epitaxial structure;

forming a plurality of second electrodes on said surface of said LED epitaxial structure; and

dicing said metallic permanent substrate, said first electrode layer, and said LED epitaxial structure to form a plurality of LEDs.

2. The method in claim 1, further comprising a step of forming a conduction enhancing layer between said first electrode layer and said metallic permanent substrate.

3. The method in claim 2, wherein the step of forming said metallic permanent substrate is accomplished by electroplating, metal cool-forming, evaporation, sputtering, or the combination thereof.

4. The method in claim 3, wherein said metallic permanent substrate is Ag, Ni, Ti, Cr, Pt, Pd, Zn, Al, In, Sn, Cu, Au, Mo, Mg, an alloy thereof, or a multi-layer thereof.

5. The method in claim 2, wherein the provisional substrate removing step is accomplished by selectively etching, lapping/polishing, wafer

lift-off, or the combination thereof.

6. A method for forming an LED device with a metallic substrate, comprising the steps of:

providing a provisional substrate;

forming an LED epitaxial structure on said provisional substrate;

etching said LED epitaxial structure until said provisional substrate to form a plurality of LED epitaxial chips;

forming a plurality of first electrodes layer on said plurality of LED epitaxial chips, respectively;

forming a dielectric layer to fill up the space among said plurality of LED epitaxial chips;

forming a metallic permanent substrate on said plurality of LED epitaxial chips and said dielectric layer;

removing said provisional substrate to expose surfaces of said plurality of LED epitaxial chips;

removing said dielectric layer;

forming a plurality of second electrodes on said surfaces of said plurality of LED epitaxial structures, respectively; and

dicing said metallic permanent substrate to form a plurality of LEDs.

7. The method in claim 6, further comprising a step of forming a conduction enhancing layer between said first electrodes layer and said metallic permanent substrate.

8. The method in claim 7, wherein the step of forming said metallic permanent substrate is accomplished by electroplating, metal cool-forming, evaporation, sputtering, or the combination thereof.

9. The method in claim 8, wherein said metallic permanent substrate is Ag, Ni, Ti, Cr, Pt, Pd, Zn, Al, In, Sn, Cu, Au, Mo, Mg, an alloy thereof,

or a multi-layer thereof.

10. The method in claim 7, wherein the provisional substrate removing step is accomplished by selectively etching, lapping/polishing, wafer lift-off, or the combination thereof.

11. The method in claim 7, wherein the material of said dielectric layer is SiO_2, Si_3N_4, SOG, photoresist, polymer, or the combination thereof.

12. The method in claim 11, wherein the material of polymer is ABS resin, epoxy, PMMA, acrylonitirle butadiene styrene copolymer, polymethyl methacrylate, polysulfones, polyetherimides, polyimides, polythersulfone, polyamideimide, or polyphenylene sulfide.

13. A method for forming an LED device with a metallic substrate, comprising the steps of:

providing a provisional substrate;

forming an LED epitaxial structure on said provisional substrate;

etching said LED epitaxial structure until said provisional substrate to form a plurality of LED epitaxial chips;

forming a plurality of first electrodes layer on said plurality of LED epitaxial chips, respectively;

forming a first dielectric layer to fill up the space among said plurality of LED epitaxial chips;

forming a conduction enhancing layer to cover said first electrodes layer and said first dielectric layer;

forming a second dielectric layer on a region of said conduction enhancing layer corresponding to said first dielectric layer in vertical direction;

forming a metallic permanent substrate on said conduction enhancing layer to fill up the space among said second dielectric layer;

removing said provisional substrate to expose surfaces of said

plurality of LED epitaxial chips;

removing said first dielectric layer;

forming a plurality of second electrodes on said surfaces of said plurality of LED epitaxial structures, respectively;

removing said second dielectric layer; and

dicing said conduction enhancing layer to form a plurality of LEDs.

14. The method in claim 13, wherein the step of forming said metallic permanent substrate is accomplished by electroplating, metal cool-forming, evaporation, sputtering, or the combination thereof.

15 The method in claim 13, wherein the material of said metallic permanent substrate is Ag, Ni, Ti, Cr, Pt, Pd, Zn, Al, In, Sn, Cu, Au, Mo, Mg, an alloy thereof, or a multi-layer thereof.

16. The method in claim 13, wherein the provisional substrate removing step is accomplished by selectively etching, lapping/polishing, wafer lift-off, or the combination thereof.

17. The method in claim 13, wherein the material of said first dielectric layer is SiO_2, Si_3N_4, SOG, photoresist, polymer, or the combination.

18. The method in claim 17, wherein the material of polymer is ABS resin, epoxy, PMMA, acrylonitirle butadiene styrene copolymer, polymethyl methacrylate, polysulfones, polyetherimides, polyimides, polythersulfone, polyamideimide, or polyphenylene sulfide.

19. The method in claim 13, wherein the material of said second dielectric layer is SiO_2, Si_3N_4, SOG, photoresist, polymer, or the combination thereof.

20. The method in claim 19, wherein the material of polymer is ABS resin, epoxy, PMMA, acrylonitirle butadiene styrene copolymer, polymethyl methacrylate, polysulfones, polyetherimides, polyimides, polythersulfone, polyamideimide, or polyphenylene sulfide.